Trend Study 14-13-99

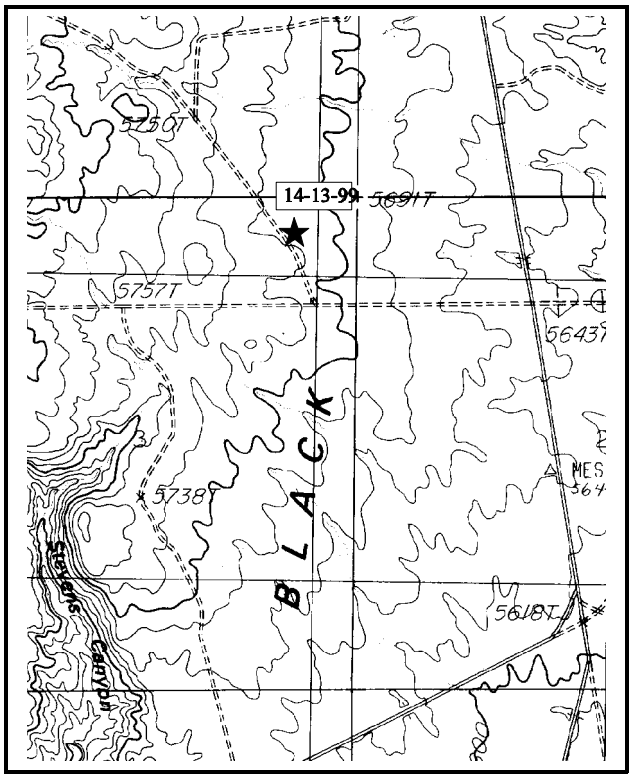
Study site name: Black Mesa . Range type: Big Sagebrush .

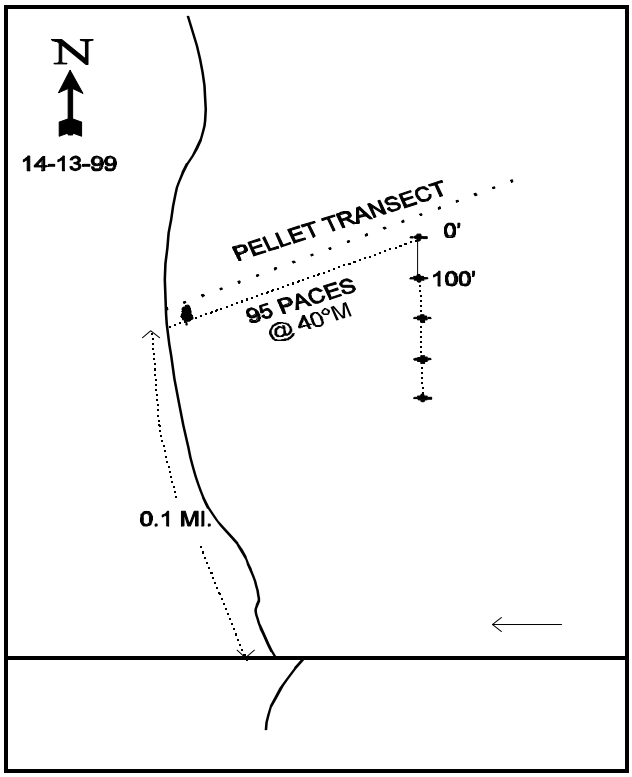
Compass bearing: frequency baseline 163°M.

Footmark (first frame at) 5 feet, footmarks (frequency belts) line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From mile marker 114 on Highway U-95 near Cottonwood Canyon east of Comb Ridge, go 0.5 miles east to County Road #233. Go south on #233 0.6 miles to a fork. Stay left and go 3.0 miles to an intersection (Road #283). Turn right and go 0.9 miles beyond a fork to the left, to a very faint road to the right. Turn right on this faint road before two gullies and go 0.1 miles to a fence post which is six feet from the right side of the road. There is a lone juniper just behind the stake. From this witness post, go about 600 feet at 40°M (following the deer pellet group transect) to the first baseline stake which is located 25 feet south of pellet transect stake #8718 (a 6 inch tall yellow rebar). The baseline stake is a three foot tall green fence post tagged #7822. The transect runs south from the 0-foot baseline stake, with 100 feet between all posts.





Map Name: Hotel Rock Diagrammatic Sketch

Township 38S , Range 21E , Section 3 UTM 4153113.532 N, 624401.546 E

DISCUSSION

Trend Study No. 14-13 (36-1)

This transect is on top of Black Mesa, considered an important deer wintering area southeast of Elk Ridge and one of the lowest sites elevationally on the unit. It is a large flat mesa dominated by open sagebrush parks and pinyon-juniper woodlands. Wyoming big sagebrush dominates the site, which is on a slight southeast facing slope with an elevation of 5,700 feet. Free water is limited in the area, but some must be available when cattle are grazing. The area is managed by the BLM, which allows 200 head of cattle to graze from the first of Oct to the end of May. Sign of cattle use was infrequent and not concentrated on the site during past readings, but pellet group data from the site in 1999 estimated 44 cow use days/acre (109 cdu/ha). Black Mesa has shown moderate to heavy use by deer, depending on the winter. A pellet group transect near the site estimated an average of 41 deer days use/acre (101 ddu/ha) between 1993 and 1997. This is an increase from the previous 5 years (1988-92) when 28 ddu/acre (69 ddu/ha) was estimated (Jense et al. 1992). Pellet group data taken on the site in 1999 estimated 58 deer days use/acre (143 ddu/ha) and 1 elk use day/acre (2 edu/ha). Human pressure in the area is generally low, however there are several mining claims staked out near the study.

The soil is a moderately deep, but compacted below the surface. Estimated effective rooting depth is nearly 14 inches. Soil texture is a sandy clay loam with a neutral pH (7.3). There is very little rock on the surface or within the profile. Due to the sandy texture and low elevation, soil temperature is extremely high averaging 76°F at an average depth of just over 12 inches. This condition gives winter annuals like cheatgrass a competitive advantage over cool season perennial grasses and forbs due to early season drying of the soil profile. Phosphorus levels are low and potassium is marginal at only 7.5 ppm and 70.4 ppm respectively. Values less that 10 ppm for phosphorus and 70 ppm for potassium are minimal for normal plant growth and development. Vegetation and litter cover are low, although erosion does not appear to be a problem due to the levelness of the terrain, combined with the high infiltration capacity of the soil.

Wyoming big sagebrush is the key browse species on the site. It formed a moderately dense stand of 3,266 plants/acre in 1986. The old, well-established stand had a fairly good age distribution of 16% young plants, 47% mature, and 37% decadent. The biotic potential (proportion of seedlings to the population) was also good at 12%. Utilization was moderate to heavy with 37% of the plants sampled displaying heavy use. Vigor was considered poor on 20% of the sagebrush sampled. The population appears to be in a steady state of decline since 1986 with the exception of 1994 when some improvements were seen in lighter use, reduced decadence and improved reproduction. However, these improvements were short lived. By 1999, use has returned to moderate to heavy and vigor is reduced on about 20% of the population. Percent decadence has increased from 37% in 1986 to 57% by 1992 and 60% in 1999. Of those decadent plants sampled in 1999, 34% appear to be dying. The proportion of mature plants in the stand has declined from 47% in 1986 to 31% in 1999. Reproduction is currently poor and dead plants are nearly as numerous as live ones. Many of these problems are the result of the extended drought the area has experienced, combined with excessively high soil temperatures and continued heavy use.

The scattered juniper in the flat are generally vigorous and could probably be slowly increasing. Point quarter data from 1999 estimate only 10 juniper trees/acre with an average diameter of 6.3 inches. There is a patch of dead trees and stumps along the baseline. The site also contains a dense population of broom snakeweed which had an estimated population of 10,132 plants/acre in 1986. Density declined to only 2,940 plants/acre by 1994, but rebounded in 1999 to 8,900 plants/acre. Only a few seedlings were encountered, yet young plants are numerous and account for 18% of the population.

The herbaceous understory contains a number of perennial grasses, however cheatgrass dominates the understory. It has increased significantly in nested frequency since 1992 when annuals were first included in the sampling design. Cheatgrass currently provides 75% of the grass cover. The occurrence of perennial

grasses is erratic and limited to small patches of galleta, some bottlebrush squirreltail, and a few needle-and-thread. These grasses showed signs of moderate utilization in 1986. Forbs are very scarce and currently ('99) provide less than ½ of 1% cover.

1986 APPARENT TREND ASSESSMENT

Vegetative diversity is poor and the key species, Wyoming big sagebrush, is in poor condition on this important winter range. The form and vigor of the sagebrush, in addition to the abundance of the aggressive increaser broom snakeweed, would indicate a downward trend is occurring on this already fairly poor site. The presence of healthy young plants is one positive sign. One management option might be to release the young sagebrush plants by treatment with a smooth light-weight anchor chain. A favorable water year would do much to improve the situation. Lack of ground cover leaves the sandy soil susceptible to erosion and there is no indication that the condition is improving. Soil trend is stable to possibly down.

1992 TREND ASSESSMENT

It should be noted that during the 1992 field season, the methodology for determining cover has changed. Rather than continue the point method (4 points on each quadrat) which estimated basal cover and did not estimate foliar cover, a slightly modified version of the Daubenmire (1959) (see methods) method was used. All measurements except for vegetation will be relatively similar. Now, cover values for vegetation will usually be much larger because they are projected over rock, pavement, litter, etc.. Total cover now can add up to over 100 percent because it is multistoried and projected over the top of rock, litter, pavement, etc. Soil trend for this site should be considered stable to slightly improving because percent bare ground has declined and there has been a substantial increase in perennial grass and forb frequency. The browse trend would have to be judged down because of a 12% loss in the Wyoming sagebrush density and an increase in percent decadency from 37% to 57%. Nested frequency for both grasses and forbs has increased substantially since 1986 which would indicate a upward trend for the herbaceous understory.

TREND ASSESSMENT
soil - stable to slightly improving
browse - down with losses in population and increases in percent decadency
herbaceous understory - up

1994 TREND ASSESSMENT

Trend for soil appears stable. Ground cover characteristics are similar to 1992 estimates. Trend for browse has improved in many areas. Density has increased, utilization is light and percent decadence has declined from 57% to 39%. Recruitment is improved with seedlings and young common. However, vigor is still poor on 21% of the plants sampled, and half of the 1,420 decadent plants sampled appear to be dying. Taking all of these factors into consideration, trend for Wyoming big sagebrush is considered up slightly. The population should remain stable with enough young plants to replace decadent and dying plants. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses. Frequency of perennial forbs declined slightly.

TREND ASSESSMENT
soil - stable
browse - up slightly
herbaceous understory - up slightly

1999 TREND ASSESSMENT

Tend for soil is up due to a decline in percent bare ground from 46% in 1994 to 38% in 1999. Litter cover also increased substantially. Unfortunately, much of the improvements are due to the dramatic increase in

cheatgrass. Trend for browse is down once again after an improving trend in 1994. Use is heavy, vigor poor on 22% of the plants sampled, percent decadence high at 60%, and recruitment poor with low numbers of seedlings and young. To make matters worse, now cheatgrass is abundant in the understory which will further decrease seedling sagebrush establishment. The improvements in sagebrush seen in 1994, must have been due to favorable climatic conditions after the 1992 reading, which enhanced the establishment of seedling sagebrush. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses and forbs has declined while the frequency of cheatgrass has increased significantly. Cheatgrass was present on the site in small numbers in 1992, however it was never abundant. Sum of nested frequency did increase significantly with every reading, yet cover was very low. By 1999, sum of nested frequency of cheatgrass increased nearly 4 fold and cover rose from ½ of 1% in 1994 to 12% in 1999. It now accounts for75% of the grass cover and 74% of the herbaceous cover. Perennial grasses, bottlebrush squirreltail, and sand dropseed declined significantly in frequency. The only common perennial grass left on the site is Galleta, a warm season species. In 1992 it provided 44% of the grass cover, although by 1999, it contributed to only 20%. Forbs continue to be very scarce.

TREND ASSESSMENT
soil - up
browse - down
herbaceous understory - down and dominated by cheatgrass

HERBACEOUS TRENDS --
Herd unit 14 , Study no: 13

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'86	'92	'94	'99	'86	'92	'94	'99	'92	'94	'99
G	Bromus tectorum (a)	-	a26	b95	c358	-	12	40	96	.14	.49	12.17
G	Hilaria jamesii	a40	b66	b75	72	15	21	25	27	4.26	4.42	3.22
G	Oryzopsis hymenoides	a-	b13	b12	ab2	-	5	6	1	.05	.08	.03
G	Sitanion hystrix	c142	b55	c131	a15	64	23	55	7	1.33	2.24	.21
G	Sporobolus cryptandrus	a-	b27	a11	a5	-	14	5	2	1.74	.39	.01
G	Stipa comata	a2	b53	c93	b43	2	26	35	25	2.02	1.75	.33
G	Vulpia octoflora (a)	-	a17	b50	b59	-	8	24	22	.04	.12	.19
Total for Annual Grasses		0	43	145	417	0	20	64	118	0.18	0.61	12.36
Total for Perennial Grasses		184	214	322	137	81	89	126	62	9.42	8.89	3.81
Total for Grasses		184	257	467	554	81	109	190	180	9.60	9.51	16.18
F	Astragalus convallarius	a-	b7	b5	ab3	-	4	3	1	.09	.04	.03
F	Chenopodium album (a)	-	b26	a-	a-	-	10	-	-	.39	-	-
F	Chaenactis stevioides	a-	b5	a-	a-	-	3	-	-	.01	-	-
F	Comandra pallida	a-	b13	b9	b11	-	5	4	4	.25	.04	.09
F	Cordylanthus wrightii (a)	-	b58	a-	a-	-	33	-	-	2.34	-	-
F	Cryptantha spp.	a-	a-	b8	a-	-	-	4	-	-	.07	-
F	Descurainia pinnata. (a)	-	b18	ab13	a3	-	7	6	1	.06	.05	.00
F	Draba rectifructa (a)	-	a-	b9	a-	-	-	5	-	-	.05	-
F	Eriogonum cernuum (a)	-	b22	ab2	a-	-	11	2	-	.13	.01	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'86	'92	'94	'99	'86	'92	'94	'99	'92	'94	'99
F	Erodium cicutarium (a)	-	-	-	2	-	-	-	1	-	-	.00
F	Erigeron spp.	2	-	-	-	1	-	-	-	-	-	-
F	Euphorbia fendleri	3	-	1	-	1	-	1	-	-	.00	-
F	Gilia hutchinifolia (a)	-	$_{b}$109	$_{a}$5	$_{a}$14	-	47	4	5	.38	.02	.22
F	Lappula occidentalis (a)	-	$_{c}$28	$_{b}$11	$_{a}$-	-	11	5	-	.30	.02	-
F	Lactuca serriola	-	-	6	-	-	-	2	-	-	.03	-
F	Lupinus spp.	$_{a}$-	$_{b}$92	$_{a}$-	$_{a}$-	-	47	-	-	.68	-	-
F	Lygodesmia spp.	-	-	1	-	-	-	1	-	-	.00	-
F	Mentzelia albicaulis (a)	-	$_{b}$39	$_{a}$-	$_{a}$-	-	18	-	-	.47	-	-
F	Medicago sativa	2	-	-	-	1	-	-	-	-	-	-
F	Navarretia intertexta (a)	-	-	3	1	-	-	1	1	-	.00	.00
F	Phlox longifolia	$_{ab}$26	$_{bc}$41	$_{c}$52	$_{a}$7	12	18	21	4	.11	.10	.02
F	Sphaeralcea coccinea	1	-	1	3	1	-	1	1	.00	.00	.00
F	Unknown forb-annual (a)	-	$_{b}$34	$_{a}$-	$_{a}$-	-	18	-	-	.33	-	-
F	Unknown forb-perennial	-	-	2	-	-	-	1	-	-	.00	-
Total for Annual Forbs		0	334	43	20	0	155	23	8	4.42	0.16	0.23
Total for Perennial Forbs		34	158	85	24	16	77	38	10	1.16	0.31	0.14
Total for Forbs		34	492	128	44	16	232	61	18	5.59	0.48	0.38

Values with different subscript letters are significantly different at % = 0.10

BROWSE TRENDS --
Herd unit 14 , Study no: 13

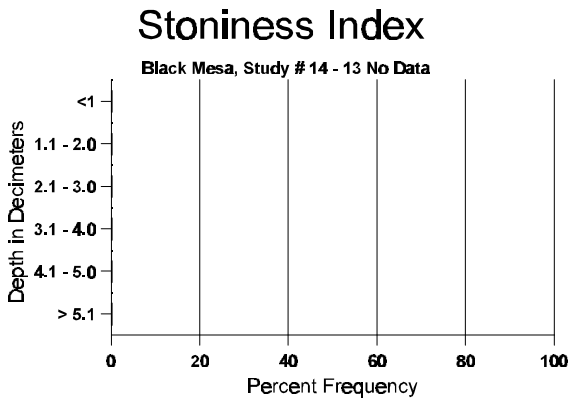
Type	Species	Strip Frequency			Average Cover %		
		'92	'94	'99	'92	'94	'99
B	Artemisia tridentata wyomingensis	57	67	63	7.89	12.23	4.72
B	Ephedra viridis	1	1	1	-	-	-
B	Gutierrezia sarothrae	51	42	70	6.96	.57	2.88
B	Juniperus osteosperma	-	-	-	-	.85	-
B	Opuntia spp.	0	1	0	-	-	-
B	Yucca spp.	1	0	2	.63	-	-
Total for Browse		110	111	136	15.48	13.66	7.60

BASIC COVER --
Herd unit 14 , Study no: 13

Cover Type	Nested Frequency '92	'94	'99	Average Cover % '86	'92	'94	'99
Vegetation	224	301	374	3.25	23.40	23.32	25.59
Rock	8	36	2	0	.45	.10	.06
Pavement	4	42	33	.50	0	.09	.06
Litter	190	376	371	38.50	27.37	29.72	38.25
Cryptogams	23	31	13	5.75	.91	.31	.08
Bare Ground	228	361	305	52.00	39.81	46.33	38.41

SOIL ANALYSIS DATA --
Herd Unit 14, Study # 13, Study Name: Black Mesa

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.7	76.0 (12.3)	7.3	60.9	16.6	22.6	1.3	7.5	70.4	0.5



PELLET GROUP FREQUENCY --
Herd unit 14 , Study no: 13

Type	Quadrat Frequency '92	'94	'99
Rabbit	52	39	75
Elk	-	1	1
Deer	22	17	34
Cattle	-	4	10

Pellet Transect Days Use/Acre (ha) '99
N/A
1 (2)
58 (143)
44 (109)

BROWSE CHARACTERISTICS --
Herd unit 14 , Study no: 13

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata wyomingensis																		
S	86	7	-	-	-	-	-	-	-	-	6	-	-	1	466			7
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	57	-	-	-	-	-	-	-	-	57	-	-	-	1140			57
	99	4	2	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	86	3	3	2	-	-	-	-	-	-	5	-	-	3	533			8
	92	7	10	-	8	2	-	1	-	-	28	-	-	-	560			28
	94	47	-	-	-	-	-	1	-	-	47	-	-	1	960			48
	99	2	3	3	2	-	-	-	-	-	10	-	-	-	200			10
M	86	9	7	7	-	-	-	-	-	-	18	3	-	2	1533	19	15	23
	92	10	16	8	-	-	-	-	-	-	34	-	-	-	680	-	-	34
	94	64	-	-	-	-	-	-	-	-	61	3	-	-	1280	25	36	64
	99	-	13	14	-	-	6	-	-	-	33	-	-	-	660	23	33	33
D	86	5	4	9	-	-	-	-	-	-	11	2	-	5	1200			18
	92	8	44	30	-	-	-	-	-	-	72	-	-	10	1640			82
	94	71	-	-	-	-	-	-	-	-	30	1	4	36	1420			71
	99	1	10	5	2	13	29	4	-	-	40	-	2	22	1280			64
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	1200			60
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	1460			73

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	29%	37%	20%	-12%
'92	50%	26%	07%	+25%
'94	00%	00%	21%	-45%
'99	36%	53%	22%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	3266	Dec:	37%
	'92	2880		57%
	'94	3660		39%
	'99	2140		60%

Ephedra viridis																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20	17	19	1
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20	19	15	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'92	00%	00%	00%	+ 0%
'94	00%	00%	00%	+ 0%
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'92	20		-
	'94	20		-
	'99	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	86	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	94	196	-	-	-	-	-	-	-	-	196	-	-	-	3920			196
	99	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	86	19	-	-	-	-	-	-	-	-	19	-	-	-	1266			19
	92	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
	94	40	-	-	-	-	-	-	-	-	40	-	-	-	800			40
	99	79	-	-	-	-	-	-	-	-	75	4	-	-	1580			79
M	86	111	-	-	-	-	-	-	-	-	111	-	-	-	7400	9	9	111
	92	364	-	-	-	-	-	3	-	-	367	-	-	-	7340	-	-	367
	94	86	-	-	-	-	-	-	-	-	69	-	17	-	1720	13	13	86
	99	356	-	-	-	-	-	-	-	-	356	-	-	-	7120	9	9	356
D	86	22	-	-	-	-	-	-	-	-	22	-	-	-	1466			22
	92	42	-	-	-	-	-	-	-	-	42	-	-	-	840			42
	94	21	-	-	-	-	-	-	-	-	2	-	5	14	420			21
	99	10	-	-	-	-	-	-	-	-	5	-	1	4	200			10
X	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	420			21
	99	5	-	-	-	-	-	-	-	-	5	-	-	-	200			10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	-18%
'92	00%	00%	00%	-65%
'94	00%	00%	24%	+67%
'99	00%	00%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	10132	Dec:	14%
	'92	8320		10%
	'94	2940		14%
	'99	8900		2%

Opuntia spp.																		
Y	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	3	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'92	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'86	0	Dec:	-
	'92	0		-
	'94	20		-
	'99	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Yucca spp.																		
M	86	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	1	-	-	1	-	-	-	-	-	2	-	-	-	40	14	19	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'86	00%	00%	00%	
'92	100%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'86	0		-
	'92	20		-
	'94	0		-
	'99	40		-